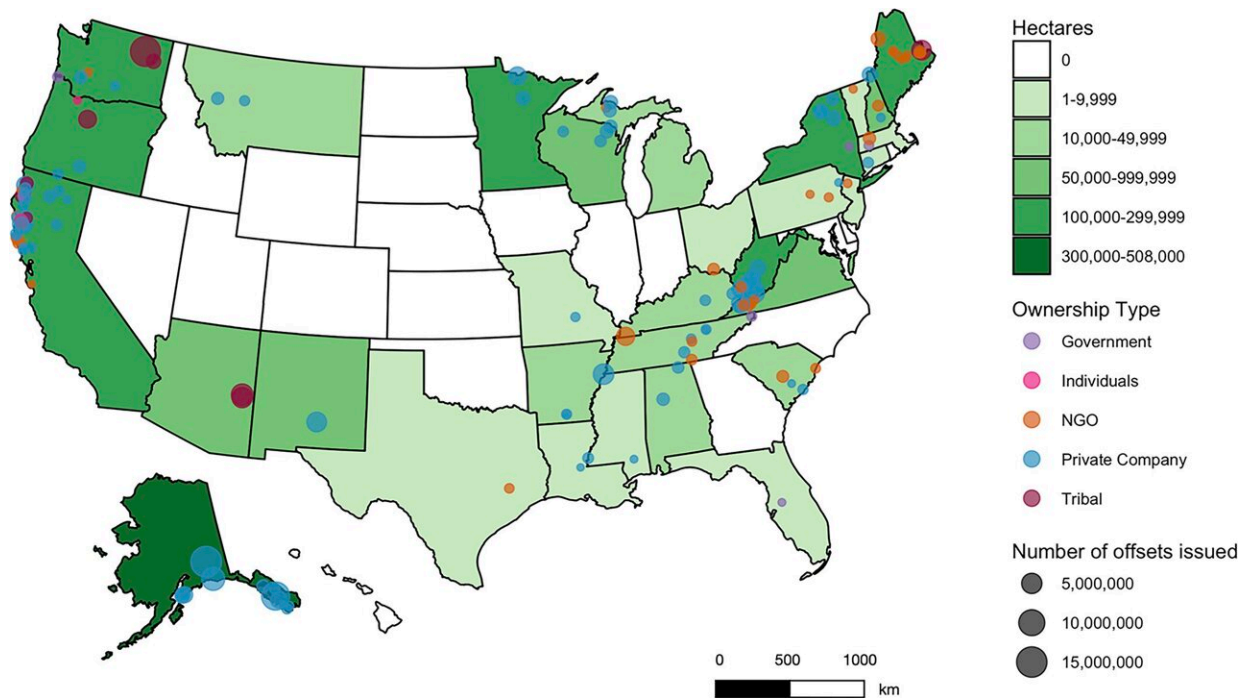


What does carbon offset actually mean for US forests?

September 13 2023, by Sarah Kuta



Locations of existing forest carbon offset projects (green, in hectares) in the United States and per ownership group (dots). Base map was drawn using R package "usmap." Credit: *PLOS Climate* (2023). DOI: 10.1371/journal.pclm.0000158

While cars, airplanes and factories are busy spewing carbon dioxide into the atmosphere, trees spend much of their time absorbing this harmful greenhouse gas via photosynthesis.

In a single calendar year, a mature tree can take in roughly 48 pounds of CO₂, which remains stored in its woody fibers until some event—like a wildfire, a pest infestation or clearcutting by a logging company—triggers its release into the atmosphere.

This natural process is at the heart of the world's [carbon](#) offset industry, in which companies and consumers counteract their CO₂ emissions by buying credits from projects that remove or reduce emissions. Carbon offsetting is part of a broader group of so-called nature-based solutions to human-caused climate change.

Now, researchers at the University of Colorado Boulder are working to bring more transparency to this fast-growing industry. With a new paper published in the journal *PLOS Climate*, they shed more light on the murky world of forest carbon offset projects in the United States, including what they entail. They also raise important questions about the risk wildfires pose to carbon offset projects, which are intended to store carbon for at least 100 years.

These findings are just the first step toward better understanding the forest carbon offset industry so that eventually, researchers and policymakers can take steps to make it even more transparent.

"As individuals and companies, we want to find ways to reduce our [environmental impact](#) and mitigate [climate change](#)—and buying [carbon offsets](#) is one of the options available to us," says study co-author Laura Dee, a CU Boulder assistant professor of ecology and evolutionary biology. "Our research aims to make sure projects receiving credits from carbon offset markets are working—and actually storing additional carbon—and identify ways to improve them."

Revealing carbon offset strategies

To be able to issue carbon offset credits, a project must be able to demonstrate that it will store more carbon than its business-as-usual approach, which may vary regionally, such as clear-cutting all the trees in an area to sell as timber. The projects must also show permanence, which is typically defined as the ability to store carbon for 100 years or longer, though this also varies.

Some examples of forest carbon offset strategies include planting new trees or conserving a forested area that would otherwise be converted into non-forest land. Others might fall under the umbrella of "improved forest [management practices](#)," a category that encompasses a wide array of activities, from thinning out some trees based on their size to delaying harvest to allow more carbon to build up.

"You can't just be doing nothing and then get [carbon credits](#)—you have to be able to demonstrate that you otherwise would be harvesting the trees, but instead you're switching management practices to store carbon that would otherwise be released," says Dee.

But until the team embarked on this study, no one really knew which strategies developers were actually using. To get a better grasp, the researchers pulled data from two registries that track these projects throughout the nation, including the project's geographic location, size, developer, owner, the year it was registered and the number of offsets issued.

From the documentation, they also tried to glean as much information as possible about what the developers were doing to store more carbon.

After analyzing their newly developed dataset, the researchers found that 96% of all carbon offset credits from U.S. forestry projects were issued for improved forest management practices. That may come as a surprise to companies and consumers, who may be under the impression they're

paying for credits that involve planting new trees or protecting forests.

"You hear a lot more focus in the news about planting trees or protecting forests, but right now, most of the credits issued from the California offset registries are really focused on changing forest management practices," says Dee. "In contrast, a lot of the analyses assessing investment in forests as nature-based climate solutions haven't looked in detail at different types of improved forest management strategies as they are being implemented on the ground."

Much of the past research on nature-based climate solutions has focused on reforestation and forest protection. But, based on these new findings, that was likely too narrow a view. Researchers should also consider the full scope of improved forest management strategies that are actually in use for the majority of forest carbon offset projects, Dee says.

"Studies on nature-based climate solutions are missing all these strategies people are using in forests, and there's a lot we still need to know about the carbon benefits and their longevity from these strategies," she says.

Understanding wildfire risk

They also compared the projects' locations to federal maps estimating the likelihood and intensity of wildfires. From this, they learned that 26% of U.S. forest carbon offset projects are in areas of moderate wildfire hazard.

As the climate continues to change because of human activities, scientists expect wildfires to become even more common and more intense. And if the trees within carbon offset projects burn, they'll release their stored CO₂ into the atmosphere, thus negating the benefits they promised.

One possible solution is to develop more robust insurance policies for carbon offset projects. But at the very least, policymakers should take wildfire risk into account when considering new forest carbon offset projects.

"We need a transparent, robust framework for evaluating and monitoring these forest-based projects so that we can secure these resources into our very rapidly changing future," says the study's lead author, Lilli Kaarakka, a former CU Boulder postdoctoral researcher who is now an assistant professor of [forest](#) management and silviculture at California Polytechnic State University.

More information: Lilli Kaarakka et al, Managing forests for carbon—Status of the forest carbon offset markets in the United States, *PLOS Climate* (2023). [DOI: 10.1371/journal.pclm.0000158](https://doi.org/10.1371/journal.pclm.0000158)

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